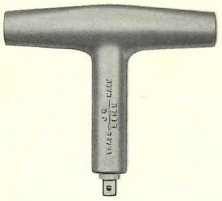
CERTIFIED JO LINE ACCURACY

JOTE SCREWDRIVER
SPEED TOOLS

JOTE 5 — Range 2 to 80 inch ounces
JOTE 40 — Range 5 to 50 inch pounds



TWO MODELS — Identical except for capacity, both standard ¼" square drive. Width across TEE, 3⅝" — height 2⅞" — diameter at drive end, ⅝"—net weight .31 pounds. Much better for small, light torquing than screwdriver shape — faster, easier to hold and less fatiguing.

ADAPTERS — Available for Phillips, Frearson, Slotted, Clutch Head and Socket Head Screws in sizes from 00 up.

OPERATION — Controls torque in right-hand direction — ratchets in left-hand direction for maximum operating speed. Also available on special order, *without ratchet,* for torque control in both right and left-hand directions. Release and reset are automatic and continuous, with no impact, no over-torque and no over-travel. Free release occurs over short arc, automatically resets and releases if rotated continually.

ADJUSTMENT — Remove two seals in TEE handle cavities by immersing both handle ends in hot water. Then adjust load screws with ordinary screwdriver and replace seals. JOTE tools are not designed for adjustment on the job — are sealed to prevent tampering by unauthorized personnel.

ACCURACY — JOTE 5, normally certified to ±2 inch ounces — JOTE 40, normally certified to ±2 inch pounds.

COLOR CODING — Provides instant identification of torque setting: Red — JOTE 5. Black — JOTE 40 at low settings. Silver — JOTE 40 at high settings.

Military Description — MIL-H-4034, Type II, Sizes 1 and 2
GGG-W-686, Type IV, Class I, Sizes 1 and 2.

TORQUE INFORMATION AND TABLES

TORQUE FORMULA

LET: T = Torque (inch pounds, inch ounces, foot pounds)
F = Force (pounds, ounces)
L = Length of lever arm (inches, feet)

Note: The lever arm is always measured along a line which passes through the center of rotation perpendicular to the direction of the force.

EQUATION: $T = FL$

TORQUE VALUE CONVERSIONS

A. Inch pounds to foot pounds (refer to Table II)

LET: T = Torque in foot pounds
t = torque in inch pounds

EQUATION: $T = \frac{t}{12}$

B. Foot pounds to inch pounds (refer to Table II)

EQUATION: $t = 12T$

COMPENSATION FORMULAE FOR EXTENSIONS

When adapters are used that rotate about a center not located at the center of the tang of the torque wrench it is necessary to compensate for the additional length. An extension will always increase the capacity of the wrench. For example, a 2 inch extension will increase the limit of a JOTITE 150 to 200 inch pounds.

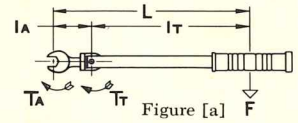


Figure [a]

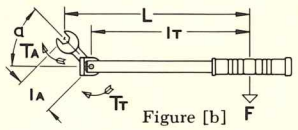


Figure [b]

LET: F = Force (pounds)
l_T = Wrench length (inches) measured from the middle of the handhold to the center of the tang.
l_A = Extension length (inches) measured from center of socket to center of drive square.
L = $l_T + l_A$ (if extension is mounted as in figure [b] measure L as shown or calculate using $L = l_T + l_A \cos a$).
T_T = Torque setting of wrench.
T_A = Torque exerted at extension.

A. To find torque setting (T_T) when desired amount of torque exerted at extension (T_A) is known.

EQUATION: $T_T = \frac{T_A \times l_T}{L}$

B. To find torque exerted at extension for a particular torque setting.

EQUATION: $T_A = \frac{T_T \times L}{l_T}$

DETERMINATION OF AMOUNT OF TORQUE REQUIRED

A torque wrench is used in conjunction with a threaded fastener for the single purpose of controlling the clamping ability of the fastener. The stresses induced in the body of the bolt or screw by tightening provide the force which does the clamping. Since the torque applied to the head of the fastener is directly proportional, or nearly so, to the load applied, it is possible to measure bolt stress by means of a torque wrench.

The first requirement in determining the amount of torque to apply is a knowledge of the desired bolt stress. If this stress is not dictated by the function of the assembly it is common practice to base the limit on the yield strength of the bolt material. Theoretically, screws and bolts may be tightened to the yield point. However, in order to avoid fastener failure during the assembly process it is recommended that the induced stress not be allowed to exceed 80% of the yield strength.

In the original design of a fastener which will be subject to external loading, whether static or dynamic, it will be necessary to establish bolt size and allowable stress in accordance with current engineering practice.

The mathematical relationship between torque applied and the resulting tension force in the bolt has been determined to be as follows:

LET: T = Torque required (inch pounds)
F = Bolt tension desired (pounds)
D = Nominal bolt diameter.

EQUATION: $T = .2\ D\ F$

This relationship is based on the assumption that commercial, steel, semi-finished, regular series nuts with rolled threads, semi-finished steel bolts are used, acting on steel surfaces without lubrication. Tests have shown these conditions will result in a coefficient of friction of .16 at both the thread and head bearing surfaces.

For the usual application this equation can be used to approximate the required torque. Tests can then be conducted to determine a more exact value, if required. In any case, it is important to maintain conditions on the job as consistent as possible to those used at the time of determination.

SPECIAL TOOLS

Quotations for Special Jo-Line Torque Tools available on request, without obligation.

TABLE I — APPROX. TORQUE REQUIREMENTS

This table is intended to give only the approximate amount of torque required to tighten a screw or bolt of specified thread size. Because the conditions affecting each application are subject to many indeterminant variables, the values listed here should not be taken as accurate limits. The compilation of these figures was based on the following assumptions:

(a) Regular series semi-finished nuts.
(b) Rolled thread semi-finished bolts.
(c) Steel nuts, bolts and bearing surfaces. All surfaces unlubricated resulting in a coefficient of friction of .16.
(d) An induced bolt stress of 40,000 pounds per square inch.

Since the ratio between torque applied and induced bolt stress is almost directly proportional, the torque values shown can be varied for different induced bolt stresses by a simple proportion:

EXAMPLE: It is desired to stress a ½-20 NF bolt to 90,000 psi. The table gives a torque value of 675 inch pounds for a stress of 40,000 psi.

THEREFORE: $T = \frac{90{,}000 \times 675}{40{,}000}$

$T = 1519$ inch pounds

Bolt Size	No. Threads per In.	Torque	Recommended Model Torque Wrench: Adjustable	Recommended Model Torque Wrench: Preset	Preset Screwdriver
0	80	16 in. oz.			p
1	64	24 " "			p
1	72	32 " "			p
2	56	36 " "			p
2	64	44 " "			p
3	48	56 " "			p
3	56	64 " "			p
4	40	5 in. lbs.	a	g	pq
4	48	7 " "	ab	g	q
5	40	8 " "	ab	g	q
5	44	9 " "	ab	g	q
6	32	10 " "	ab	g	q
6	40	12 " "	ab	g	q
8	32	22 " "	ab	gh	q
8	36	22 " "	ab	gh	q
10	24	29 " "	ab	ghi	q
10	32	34 " "	ab	hi	q
12	24	62 " "	ab	ij	
12	28	62 " "	ab	ij	
¼	20	70 " "	ab	ij	
¼	28	80 " "	ab	jk	
5/16	18	140 " "	abcdf	jk	
5/16	24	150 " "	abcdf	jk	
⅜	16	250 " "	cdf	jk	
⅜	24	275 " "	cdf	k	
7/16	14	390 " "	cdf	k	
7/16	20	430 " "	cdf	kl	
½	13	630 " "	cdf	l	
½	20	675 " "	cdf	l	
9/16	12	870 " "	def	l	
9/16	18	975 " "	ef	lm	
⅝	11	1200 " "	efrs	lm	
⅝	18	1350 " "	efrs	lm	
¾	10	2200 " "	rs	m	
¾	16	2330 " "	rs	m	
7/8	9	3450 " "	rs	n	
7/8	14	3720 " "	rst	no	
1	8	433 ft. lbs.	t	no	
1	14	475 " "	t	no	
1⅛	7	608 " "	t	o	
1⅛	12	687 " "	t	o	
1¼	7	812 " "	t	o	
1¼	12	942 " "	t	o	
1⅜	6	1133 " "	t		
1⅜	12	1333 " "	t		
1½	6	1500 " "	t		
1½	12	1666 " "	t		

LET: a = JOTITE 150 b = " 180 c = " 750 d = " 900 e = " 1600 f = " 1800 g = JOTRU 5
h = JOTRU 5A i = " 10 j = " 10A k = " 50 l = " 100, 100A m = " 250
n = JOTRU 500 o = " 1000 p = JOTE 5 q = " 40 r = JOMI 4800 s = " 4812 t = " 1202

TABLE II — TORQUE VALUE CONVERSIONS

EXAMPLE: Convert 57 foot pounds to inch pounds:

50 ft. lbs. = 600 in. lbs.
5 ft. lbs. = 60 in. lbs.
2 ft. lbs. = 24 in. lbs.
57 ft. lbs. = 684 in. lbs.

Ft. Lbs. to In. Lbs.		In. Lbs. to Ft. Lbs.	
1	12	1	.08
2	24	2	.17
3	36	3	.25
4	48	4	.33
5	60	5	.42
6	72	6	.50
7	84	7	.58
8	96	8	.67
9	108	9	.75
10	120	10	.83
15	180	15	1.25
20	240	20	1.67
25	300	25	2.08
50	600	50	4.16
100	1200	100	8.33
200	2400	200	16.66
500	6000	500	41.65
1000	12000	1000	83.33
2000	24000	2000	166.60
		5000	416.50